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ABSTRACT

The Nordic countries have worked together over the last decade to enhance the efforts of environmental educators. This document details: (1) the history and activities of the group responsible for the coordination of efforts at the university level; (2) the types of environmental education occurring in Denmark, Iceland, Finland, Norway, and Sweden; (3) trends in the future of environmental education; (4) educational research and cooperation; and (5) a survey of topics discussed at Nordic conferences from 1980 to 1985. (CW)

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- Recommendations

University level:

Environmental education

Secretariat for
Nordic Council of Ministers
Copenhagen June 1987

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Forword

In the introduction of the new report submitted by the world commission for environment and development - the socalled "Brundtland-report", there is an enumeration of the intensified threats against our possibilities of survival: emission into the atmosphere, spreading of deserts, soil erosion and the consequences of the gap between the rich and the poor countries. According to the report, the human and technological resources are now so considerable that it is possible to change course and go towards "a development which is solid and which implies a new and quite necessary growth period in the world economy". Growth and environment are no longer necessarily contrary terms. The rich countries should not put the brake on their growth but should use it, among other things, for making a global effort. The foundation has thus been made for concentration and coordination of the efforts - both nationally and internationally - in order to contribute to solving global environmental problems. In UNESCO, environmental questions are treated at various places in the biannual programmes and budgets. On the one hand, UNESCO tries to elaborate appropriate models for environmental education at all levels of the educational system and, on the other hand, UNESCO did - as early as in the 1970s - establish a special environmental research programme. The programme covers activities which are carried out by partly independent committees whose members are scientists and researchers from all member-states of the UN. The activities consist, to a great extent, of education and further education of environmental technicians and researchers, particularly from the developing countries. Great emphasis is placed on the creation of international scientific networks and the exchange of information between researchers of the industrial countries and the developing countries.

The future effort must consist mainly in the strengthening of education and research within the areas where the threats against the environment are most imminent - like water pollution, forest deaths, spreading of deserts, etc. and must be made in harmony with the very important role which has been given to the UN-environmental programme (UNEP).

The Nordic countries are aware of the fact that the UNESCO-General Assembly, which will meet in October 1987, will take up discussions of UNESCO's 6-year plan for the period 1990-95. At that time, there will thus have been created possibilities for working for an increased effort in the environmental field.

The National Commissions for Unesco in the Nordic countries have asked the Contact Group for Environmental Education at University Level to elaborate a report for the UNESCO/UNEP-conference on environmental education which will take place in Moscow in the period 17 - 21 August 1987. The Contact Group accepted to elaborate this report which summarizes the decade which has passed since the UNESCO/UNEP-conference in Tbilisi in 1977 when the group presented a report financed by the Nordic Council of Ministers. Furthermore, the group has made an inventory of the environmental cooperation at the Nordic universities and other institutions of higher education and has presented its thoughts with regard to challenges and cooperation in the future.

The report has been edited by Steffen J. Wolf, Head of Section assisted by stud.mag. Maja Winther Bengtsson, the Danish Ministry of Education.

CHAPTER I: HISTORY

(The Activities of the Contact Group, Conferences, Teaching Materials, etc.)

For the past decade, there has been active Nordic cooperation on environmental education at university level. In recent years, the **Contact Group for Environmental Education** has organized seminars on environmental education in various university disciplines. The group has produced a series of text-books covering a wide range of topics and has acted in a catalytic and coordinating role for environmental education in the Nordic countries.

Nordic cooperation is extensive and covers most aspects of social, economic, technical, scientific and cultural policy and development. In the area of education and culture, formal cooperation between the Nordic governments started in the late 1940s. Since 1972, the Secretariat for the Nordic Council of Ministers located in Copenhagen has been the focus of this work. The environmental education contact group has been active until 1986 within the framework of the Secretariat.

Reasons for Nordic Cooperation

Nordic cooperation in the field of environmental education is natural and appropriate for many reasons. On the one hand, the natural characteristics common to the Nordic countries mean that the environmental problems of all countries are to some extent similar. On the other hand, each country has sets of special environmental problems due to differences in natural conditions or social, economic or technical development. Comparisons become fruitful since these differences occur within a wider framework of common characteristics.

All the Nordic countries have in recent decades developed environmental policies and environmental education programmes. Therefore, there is much substance to draw from. Since emphasis has been somewhat different in the different countries, experience can be shared and compared. In Sweden for instance, a comprehensive programme to clean up municipal effluents has resulted in drastically decreased water pollution. In Norway, the almost total dependence on hydro electric power has given that country a great deal of experience concerning the environmental impacts of power development. Land use planning and zoning was pioneered in Denmark owing to the relatively greater pressure of population upon land. In Finland, the integration of exploitation and protection of peat wetlands provides an interesting example of resource management. Much has been learnt from the fight against soil erosion in Iceland.

Apart from the natural, social, economic and technical reasons for cooperation in the field of environmental education, there is

the further reason that the number of experts with specialized competence in relevant sciences is small in each country. Exchange of information, production of textbooks, common seminars and courses offer an important means of counteracting the disadvantage of smallness.

Nordic cooperation in environmental protection is a further reason to cooperate also in education. A Nordic convention on the protection of the environment is a concrete result of this cooperation.

In 1972, the Nordic Council of Ministers decided on an action plan for environmental education. The Nordic Senior Officials' Committee for Environmental Affairs was given the task of studying the possibilities for closer cooperation in the area of environmental education. Several projects and studies of environmental education at all levels of the educational system were undertaken to translate the plan into concrete action.

School Cooperation

The work concerning environmental education for the school level was taken over by the Nordic School Cooperation Group, which is an organization connected with the Secretariat for the Nordic Council of Ministers.

In the period 1975-79, a number of courses on content and methodology of environmental education were held. The school project combined didactic research and development with these instructor courses. On a national basis, the further education of teachers was coordinated with development of curriculum material for the use in primary and secondary schools, teacher training and further education of teachers. The school project was completed in 1981. It ended with an evaluation conference which concluded that the model for cooperation - a Nordic contact group combined with national working groups - had worked well and that the project had had an impact in all the Nordic countries.

As a result of this project, Nordic "biennials" are held on environmental education in school. The first - **Miljö 83** (Environment 83) - was organized by the Swedish National Board of Education. The Second - **Miljö 85** - was held in Oslo in June 1985. The third - **Miljö 87** - was held in Helsinki in June 1987. And **Miljö 89** will be held in Copenhagen in June 1989.

Cooperation at University Level

For the university level, several areas for cooperation were identified:

a) Production of teaching materials.
b) An annual, specialized seminar on environmental education.
c) Nordic cooperation concerning environmental education related to the Nordic efforts at international development work.
d. Coordination of the environmental components of the research and education of other Nordic institutions.
e. Regular updating of the inventory of courses in environmental education of other Nordic institutions.
f. Regular updating of the inventory of courses and literature at university level.
g. Expert evaluation of courses and curricula on a Nordic exchange basis.

At university level, concrete cooperation on environmental education was started by an inventory of on-going work. In 1975, a report giving details of courses at university level in Denmark, Finland, Norway and Sweden was published. The main emphasis of this report was on interdisciplinary courses. The report also contained a systematic survey of literature used in these university courses. The report was extensively used in all Nordic countries since it appeared during a period when many universities were setting up courses or study units pertaining to various aspects of environmental protection, work environment, pollution control, etc.

In 1976, the Environmental Studies Programme of the University of Lund organized a Nordic conference on environmental education at the request of the Council of Ministers of Culture and Education. Educators, administrators and representatives of environmental organizations took part in the conference. The purpose was twofold. Since environmental education had at that time been part of the curriculum of many universities for almost a decade, it was deemed useful that those involved met to exchange ideas and experience. Secondly, the conference was to explore the possibilities for further Nordic cooperation.

Out of the conference came many recommendations for future cooperation. One group dealt with environments particular to the Nordic countries which would be suitable objects for research and teaching. The conference produced a list of criteria for the selection of such environmental field-study sites. The nature of environmental problems, the quality of available documentation, and the types of human influence in the area were among the factors discussed as criteria. The need for more information on environmental education was stressed in several recommendations. The overview provided by the catalogue published in 1975 was considered so important that it was recommended that it should be

updated on a regular basis. The conference further recommended that a series of more specialized seminars or conferences on environmental education within relevant areas of university education should be held on a joint Nordic basis. A major recommendation of the conference was that production of textbooks on environmental matters should be undertaken by the Secretariat for the Nordic Council of Ministers in Copenhagen.

Contact Group

In order to carry out the concrete work, a **Contact Group for Environmental Education at University Level** was appointed by the Senior Officials' Committee for Education and Cultural Affairs.

The idea was that the representatives in the contact group would be backed by national reference groups in the respective countries.

In Denmark, such a reference group was formed. The group has been quite active both in supporting the work of the contact group and in producing information, holding seminars, etc.

In Finland, two committees for environmental education have been active. One of these submitted a report on national implementation of the Tbilisi recommendations in 1979. The other reported in 1982 mainly on didactic experiments, training of teachers and development of teaching materials.

In Iceland, there is no formal reference group. Informal groups have convened occasionally in connection with the work of the contact group, e.g. to plan the seminar held in Reykjavik in 1983.

In Norway, there is no special national reference group. However, a committee working for the seminar and exhibition **Miljö 85** has had much the same function.

In Sweden, an interministerial working group on environmental education was formed with representatives of the various ministries and agencies and from the universities. It was dissolved in 1983 and the respective government agencies briefed to pay due regard to environmental education.

All the Nordic countries participate actively in a number of international organizations concerned with environmental protection and environmental education.

The world conference on environmental education was organized by UNESCO/UNEP in Tbilisi in the Soviet Union in 1977. At one of the preparatory meetings for this world conference, held in Helsinki in 1977, the Nordic delegations requested that the Secretariat for the Nordic Council of Ministers coordinate the Nordic preparation for the Tbilisi meeting. The Senior Officials' Committee approved and provided funds for two publications: "Environmental Education in the Nordic Compulsory Schools" and "Environmental Education in the Nordic Countries".

Projects of the Contact Group

1. Series of seminars on the integration of environmental matters in higher education

The object of holding a series of such seminars is to promote exchange of information and experience. Participants and lectures at these seminars come both from education and from environmental protection, industry, national administrations, etc. Discussion and planning of the production of textbooks and other educational material have been important parts of these seminars. A number of experts were invited to present plans for texts in areas suitable for joint Nordic production. During the seminar, these plans were discussed and structured. Editorial groups, reference groups or other suitable arrangements usually arrived during the seminars. The seminar also gave important background for setting the priorities for the production of textbooks.

An overview of existing environmental education within the specialized field was prepared and presented at these seminars as a background to discussions. It also serves to update and complement the inventory published by the Secretariat for the Nordic Council of Ministers.

Excursions and field-trips were included in the seminars in order to provide examples of concrete environmental problems and to take advantage of local expertise in discussions on these problems.

1.1 Higher Technological Education

In 1980, the Committee for Environmental Studies at the University of Trondheim hosted a seminar on the integration of environmental education into higher technological education and training. Since integration into higher technological education is probably one of the most important tasks for environmental education, this topic had been chosen as the first in the series of

seminars. Both work environment and environmental protection were discussed and analysed. It was noted that there are marked differences in the level of success of integrating environmental education into higher technological education in the different countries. In Norway at the time, more than 70 p.c. of all engineering students attended an interdisciplinary environmental introduction course. In the other countries, attendance was markedly lower. The problems of getting interdisciplinary environmental courses integrated into compulsory studies were analysed. Crowding of engineering curricula and resistance of educational planners were identified as major obstacles. The seminar noted that educational planning in higher technological education is more responsive to labour market considerations than to analyses of societal needs for knowledge and awareness.

The seminar discussed four different types of environmental education within higher technical education:

a. integration of environmental protection and work environment in all relevant subjects and courses,
b. interdisciplinary overview and introduction,
c. specialist education and training,
d. thorough complementary education mostly of an interdisciplinary nature.

It was noted that the level of integration of environmental matters is difficult to assess. Traditional environmental engineering has developed in the recent decade.

Interdisciplinary studies as noted above have made much less headway.

Some specialist training mainly related to pollution control, but to an increasing extent in recent years also related to work environment, has taken place. Thorough complementary, interdisciplinary education is generally lacking in all the Nordic countries.

1.2 Higher Agricultural Education

In cooperation with the Danish national reference group, the Contact Group in 1981 organized a seminar on the integration of environmental matters into higher agricultural training.

Integration of environmental matter has proceeded further in agricultural education than in many other fields of higher education. Most of the agricultural universities have interdisciplin-

ary environment centres, institutions for environmental protection or nature conservation and the like. A major problem in agricultural education and research is to strike a balance between production interests and environmental protection. This was clearly seen in the heated discussions on alternative methods of production, pesticide-free growing, "organic farming", etc.

The close interrelationship between environmental protection and natural resource use is clearly illustrated in agricultural education. One of the projects for a joint textbook that came out of this seminar was on the topic of energy and agriculture. One of the features of the seminar, which participants found most useful, was the critical, comparative analysis of environmental education in the Nordic countries, which had been commissioned by the Danish national reference group. One person had travelled around visiting centres of agricultural education in the Nordic countries looking at study plans, curricula, discussing with students and teachers. The discussion paper that resulted from this study provided a good basis for discussion and analysis during the seminar.

1.3 Planning Education

In cooperation with the Finnish authorities, a seminar on higher planning education was given in Helsinki in 1982.

One problem of integration is that the concept of environment is wider and less scientifically based in planning education. In one sense, all planning education is about the environment. However, environmental protection, pollution problems, etc. in the post-war period have added new dimensions to planning education. Physical planning takes place at the interface between a tradition with its roots in architecture and technical and legal control of the built environment on the one hand and on the other hand the new knowledge of environmental problems produced by the natural sciences. For this and many other reasons, physical planning in the Nordic countries is in something of a crisis of identity. Ecology has been given both a normative and an instrumental role in planning.

One example of recent development is "ecological planning". The Nordic Council of Ministers has funded a project in this area which was presented and discussed at the seminar. This project has now resulted in a textbook on landscape planning. As a result of the seminar, another joint Nordic text on landscape planning has been produced.

In further education of planners, a special Nordic cooperative

effort is already taking place. The Nordic Institute for Studies in Urban and Regional Planning (Nordplan) trains active planners on a regular basis. The environmental components of this training has increased in recent years.

1.4 Biology at University Level

In cooperation with the Biology Institute of the University of Iceland, a seminar on the integration of environmental matters in higher biological education was held in Reykjavik in the summer of 1983.

Among the many problems analysed at this seminar was the effect of labour market problems on the education of biologists. In all countries, the school system is now requiring smaller numbers of biologists.

In recent decades, biologists have been able to obtain jobs in the growing field of environmental protection. Developing areas such as biotechnology may provide further outlets for biologists. However, in both these areas, biologists have to compete with students from institutions which by tradition have better contacts with the labour market, larger proportions of applied studies and stronger traditions of marketing their students than universities.

The pressures on the biology curriculum are also great. There is both the pressure of increased development of knowledge in many areas of biology and the pressure to include non-biological subjects in order to increase the competitive potential of biologists on the labour market.

New lines of study in biology combined with planning, environmental protection, etc. has had a tendency to crop up at other centres of higher education than the universities - regional colleges, etc. The larger universities, where in principle the potential for interdisciplinary education should be best, since the necessary specialist institutions exist, seem to have had more difficulties in adapting to changes.

1.5. Geology, Geotechnics and Physical Geography

In the summer of 1984, a seminar aimed at physical geography, geology and geotechnics was held in Narssarssuaq, Greenland, in cooperation with the Danish national reference group. Greenland is of great general geological interest and also has a number of environmental problems related to mining and other uses of natural resources.

Topics discussed during this seminar included the role of geography in schools, which has generally diminished, thus taking away one natural channel for environmental information into the school system. At university level, physical geography has been one of the areas where environmental education first developed at university level in several of the Nordic countries. Methods of remote-sensing for environmental analysis were presented. The new field of geomedicine was summarized, and the implications for education in the earth sciences were discussed. Several lectures dealt with collection and presentation of background data on the physical environment for planning and environmental protection.

Proposals for production of texts on geomedicine, geological and other earth science data in physical planning, waste disposal in geological formations and physical geography for development planning were discussed.

The opportunities for field-trips were extensively used. The site for a proposed uranium mine at Kvanefjeld was visited, and participants were briefed on the planning and exploration work, environmental impact assessment and studies of expected consequences on the local settlement. The municipality of Narssaq gave a presentation of the economic development in the area, local views on environmental effects of the proposed uranium mine and on development prospects in the area.

1.6 Law and Environmental Education

In 1985, a seminar on the integration of environmental aspects in education in Law was held in Sweden. Many administrators have Law studies as their academic background. Since one of the trends in environmental protection is to integrate environmental aspects into the general process of decision-making, it is important that administrators get some environmental education as part of their basic education and training.

The main goal of the conference was to lay the foundation for the elaboration of teaching materials for environmental education for the legal profession. Another main theme was the strengthening of the discipline: Environmental Law as a law discipline.

The general impression was that environmental law as a discipline has a weak position in the Nordic countries. The picture does however vary somewhat. It seems to be more positive in Denmark, whereas Norway is the example of a country where environmental law has a particularly weak position in law education.

Within the compulsory disciplines of the law education, there are elements of environmental law in the law of property and in administrative law. The elements are however often characterized by other points of view than those concerning the consequences for the environment. Here one should not focus only on the legal profession but also on other professions. This is so much more obvious since the teaching of environmental law does not concentrate so much on the application of the law as the ordinary law education, but focuses more on various means of administration and prerequisites - including legal prerequisites - for their efficiency.

There are several reasons for the fact that it has been difficult to integrate environmental law in the law education. Inertia in the university system has been one factor. The limited study time available has been another factor; environmental law must compete with other disciplines.

A lack of teaching materials for environmental law constitutes a third factor. Yet another important factor are features characterizing the discipline environmental law itself: it crosses traditional law discipline subdivisions and approaches, and the relevant legal way of presenting the problems must be built on the actual problems more than on the law. Particularly ecological knowledge is of importance for the elaboration of rules of law and the application of legal principles, e.g. on proof and on the burden of proof and on the giving of expert opinions in administrative law. These features mean that environmental law, to a certain extent, departs from costumary law for the traditional legal profession. If environmental law is to have a place in the teaching of law at university level, it will be necessary to find key persons at the law faculties who are engaged in environmental law.

There was a general impression that the delimitations of the discipline are somewhat blurred and it may vary from person to person dealing with it, but that it has a firm and incontestable nucleus. The question of delimitation should be had in mind both in relation to the different recipient groups and when elaborating teaching materials, as the teaching of environmental law should also be directed towards other professions and professional groups than the legal profession.

2. Production of Educational Materials and Textbooks

There are, as stated above, many good reasons for joint Nordic production of textbooks. In many specialized areas, the market for production of textbooks in any one of the countries is too small. Since students in higher education institutes are in prin-

ciple required to be able to read at least the three Scandinavian languages Danish, Norwegian and Swedish, it is possible to combine the markets without issuing separate versions for each one of the countries. In many areas, the necessary expertise is also easier to assemble if one uses the entire family of Nordic countries. The possibilities for comparative studies between the countries is also an important motive for joint production of texts.

As a result of preparations, discussions and deliberations at the various seminars, a number of textbooks have been produced.

The following gives examples of books which have been published or are being produced at the present time:

L. Emmelin (ed.): Kulturlandskap och samhällsplanering (Landscape and physical planning). Tapir, Trondheim, Norway, 1984. 258 pp.
E. Oksanen: Energi från lantbruket (Energy from Agriculture). Tapir, Trondheim, Norway, 1984. 54 pp.
J.A. Eie (ed.): Forsurning (Acidification, i.e. the effects of "acid rain on forest, fresh water ecosystems, etc.). Tapir, Trondheim, Norway, 1985. 120 pp.
C.J. Engström: Energiförsörjning: miljö, samhällskonsekvenser och planeringen (Energy: Environment, Societal Consequences and Planning). (In production).
A. Willumsen (ed.): Geodata (Geological and other earth science data in physical planning). (In production).

2.1 Texts for Environmental Education in the Training of Development Personnel

The contact group has throughout its work stressed the importance of using the joint Nordic experience in international development work to promote the integration of environmental education into the training of development personnel. In cooperation with the development agencies of the Nordic countries, texts specially aimed at development personnel or environmental educators concerned with international development, are being produced.

The following gives examples of books which have been published or are being produced at the present time:

J. Pedersen: Overføring av teknologi til utviklingsland (Technology Transfer to Developing Countries). Universitetsforlaget, Oslo, Norway, 1983. 46 pp.
L. Landner: Water Management and Protection of Aquatic Living Resources in Tropical and Sub-tropical Climates. Tapir, Trondheim, Norway 1985. 128 pp. Published in English.

S. Christiansen, Gunnar Poulsen (eds.): Environmental Aspects of Agricultural Development Assistance. Tapir, Trondheim, Norway 1985. 112 pp. Published in English.
Lennart Strömqvist (ed.): Environmental Degradation of the Developing Countries and the Role of Earth Sciences in Conservation (1987).

Catalytic Role

The working group has also been instructed to try to catalyze environmental education within the work of other Nordic organizations. To that end, a joint meeting between representatives of Nordplan, and the Nordic councils for ecology, physical oceanography and marine biology and the Nordic research courses was held to explore possibilities of increasing activities in environmental education.

As a result of this meeting a research course in ecology and physical planning was organized by the Committee for Environmental Studies at the University of Trondheim in cooperation with Nordplan and financed by the Nordic Council for Ecology.

Finally, in January 1986, the group arranged a meeting at the Norwegian embassy in Paris with representatives of the UNESCO Environmental Education Unit, the OECD, the Council of Europe and the EEC with a view to investigating the possibilities of future cooperation projects, exchange of teachers, students, production of teaching materials, theme conferences, further education, etc.

At the end of 1986, there are no longer any appropriations set aside for the Contact Group under its present organizational form, and an action plan will be presented with a view to deciding whether to continue the Nordic cooperation in the field of environmental education and research. Reference is made to Chapters 4 and 5.

CHAPTER II: INVENTORY OF ENVIRONMENTAL EDUCATION IN THE NORDIC COUNTRIES

The initiatives of the international organizations, OECD and the Council of Europe, to define educational tasks and particular interdisciplinary possibilities of cooperation in the field of environmental education launched a Nordic cooperation which in reality was not started till the meeting in Frostavallen, Sweden in 1976.

10 years after the Tbilisi-conference, an inventory has now been made of the effect of what has been accomplished till now, where a number of areas have been treated at joint Nordic conferences as part of the cooperation and with a view to publishing teaching materials.

The inventory of environmental education in 1987 shows that there is still a way to go before all relevant groups participate in environmental education. Therefore, there are reasons to propose new course structures and to take new initiatives in order to ensure a balanced representation of environmental education in higher education.

In the following, abstracts have been elaborated of the development of environmental education in each of the Nordic countries:

In Denmark:

Environmental education has been established on 3 fronts: within the traditional courses of education, in a cooperation across faculty lines and in a cooperation between different institutions. The result of this has been a rather high degree of interdisciplinary interest and qualification of the students.

With few exceptions (environmental studies/Aarhus University), the courses have been based on the immatriculation of the participants at a higher education institution. The level of the course content varies from being comprehensible for new students to being specialized graduation courses.

As regards the content, the courses cover a wide range of areas - from narrow natural sciences problem areas to superior social sciences environmental management aspects.

The joint environmental course of the universities and other institutions of higher education (LFM) at the University of Copenhagen is the basis for the cooperation between the institutions in the Eastern part of Denmark. The course is set up as problem-oriented instruction and attracts students from different university disciplines not exceeding, however, 20 - 30 per year. The

course is a cross-institutional experiment without permanent staff. A course supervisor and a number of teaching assistants are taken on for each course, and "specialists" can be called in according to need. The teaching is centered on project work in the individual course topics: 1st course: Nitrate pollution, 2nd course: Environmental criminality. The choice of topics aims at attracting students with the broadest possible variety of disciplines.

On the same line, the Laboratory for Human Ecology at Aarhus University is the basis for the cross-faculty cooperation in the Western part of Denmark, and it offers education from the same concept as the University of Copenhagen. The course is attached to the university and covers the Arts, the Medical, the Social Sciences and the Natural Sciences Faculties. The teachers are permanent teaching staff from the discipline areas: Philosophy, Medicine, Law, Economics, Geology, Geography, Biology and Chemistry. "Specialists" with professional experience in environmental management and techniques are called in as guest professors. In addition to project work within a broad course topic (e.g. "The Aarhus-bay area"), the students shall gain insight into the methods of the individual disciplines as far as analysis and solution of environmental problems are concerned.

An Environmental Protection Centre has been set up at the Royal Danish Veterinary and Agricultural University which is instrumental in bringing about coherence in the work of the different departments of the university by arranging courses and seminars. As an example to this effect can be mentioned the course "Environmental Management", the aim of which is to give the students a broad insight into the physical environment and its management and hereby to give elementary knowledge so as to enable them to understand interdisciplinary coherence and divergence in the environmental problems which are to be solved in a way which is both ecologically, economically and administratively justified.

The engineering colleges offer two modules in the common study programme ("Environmental Education" and "Work Environment") which are more or less the same in all the engineering colleges in Denmark. The aim of the module "Environmental Education" is to inform the students of the environmental legislation and its intentions. An introduction is given to elementary ecological laws, and examples are given of possible consequences of interferences in ecosystems. In connection with the reference to some pollution problems, some technical ways of solving such problems are indicated.

The modular structure of the studies at the Technical Univerity of Denmark and at the Engineering Academy of Denmark has been accompanied by special goals as regards the integration of environmental education for all branches of study. This has been realized partly in a greater degree of integration of environmental matters in the compulsory education partly in independent "environmental disciplines". The environmental discipline "Chemical environmental education" deals with the impact of chemicals on the external environment in relation to production, transport and use of such in a modern industrial society. Great importance is attached to creating familiarity with environmental-toxilogical concepts, working methods and evaluation criteria.

There is also a special institute for work environmental studies at the Technical University of Denmark which offers a number of courses on work environment.

In Iceland

The environmental education in Iceland is mainly concentrated in the departments of engineering and biology.

In the ollowing, 4 examples can be mentioned:

1. A general interdisciplinary common introduction course in environmental education for 1st year engineering students at the electronical and mechanical branches of the Engineering College of Iceland. The aim of the course is to give the students an insight into Man's influence on the environment and the possibilities of limiting the negative influence. It deals, among other things, with pollution and the fight against pollution.

2. A course in general ecology in the biology study programme at the University of Iceland, the Department of Biology.
   The 104 hours of the course are spent on lectures and field-studies. The students are familiarized with basic ecological concepts, theories and working methods.

3. A non-obligatory course in environmental education for the 3rd and 4th year engineering students at the University of Iceland.
   The topics of the course are related to Icelandic conditions and the natural resources on which the country depends. The course is of a limited duration: 22 hours, and it concentrates on general matters. Thus, a concept like "Nature ae-

stetics" is dealt with in connection with Man's technological interference on nature.

4. A non-obligatory course in environmental education for 3rd year students of biology at the University of Iceland, the Department of Biology.
Here special emphasis is placed on land use.

Furthermore, the Technological Faculty has 2 courses aimed at students of civil engineering who have completed a course in hydraulics in their 2nd year of study and a course in hydraulics and hydrology in their 3rd year of study. These courses are:
A. a course in water supply and warm water supply
B: a course in drainage techniques.

In Finland:

Environmental education is arranged at some universities where it is either linked with natural sciences study programmes or forms a separate subject.

There is no actual tradition of environmental teaching in Finnish universities.

A course in environmental education is included in the general background studies of the teacher training syllabus. The emphasis in the course is on ecology and environmental protection.

Environmental protection can be studied as a main subject at two universities: the University of Helsinki and the University of Jyväskulä. Education in environmental hygiene is given at the University of Kuopio. Some universities offer environmental protection in their advanced non-degree programmes.

In the following, 3 examples will be mentioned:

1. ENVIRONMENTAL PROTECTION AT THE UNIVERSITY OF HELSINKI

The Department for Environmental Protection.

In the education of environmental protection, it is endeavoured to give a picture of how the nature economy has been built up in the evolution process, how it functions and how Man's activities can cause disturbances to it. Taking this ecological-biological basis as a point of departure, it is endeavoured to create a model for how Man's activities ought to be carried out in order that they can be linked to the energy streams and to the circulation system of substances with as little friction as possible. The elaboration of this new

functional model gives the environmental protection dimensions as regards technology, national economy, public health, policies with regard to developing countries and demography as well as social, legal and administrative dimensions. The education includes that the students take practical part in influencing the environmental protection.

2. UNIVERSITY OF HELSINKI: DEPARTMENT OF MATHEMATICS AND NATURAL SCIENCES

The study programmes in biology

In the biology study, specialization can be made in the following subject areas:
- systematic-ecological botany
- morphological-ecological botany
- hydro-biology
- physiological botany
- physiological zoology
- genetics
- general microbiology
- biology teacher training.

Almost all biology students participate in the series of lectures: "Man and his Environment" during the general introduction studies of the first year of study. This series of lectures treats the most important global and national environmental problems with special emphasis placed on ecology. This series of lectures is very popular and the participants come from the entire department of mathematics and natural sciences (students of chemistry, physics, geology, geography, etc.; about 200 - 300 participants per year).

In the basic and in the specialized biology studies, there is to a very great extent integration of environmental subject-matters. This particularly applies to knowledge which is important with regard to nature conservation and ecology, and the biologists who are examined in this have particularly good skills for working within this area.

The environmental subject-matter can also form part of the final examination subjects. A considerable part of the examination papers treat environmental questions.

Biology students at the University of Helsinki have access to a large offer of education, and it is possible even to have in-depth insight into the ecological and physiological aspects of environmental protection. But there is practically no education

in the planning of land use, environmental hygiene and environmental law. Also the prerequisites for a broader evaluation of environmental effects are bad. In order to be able to carry out administrative tasks, the students must have knowledge in the subjectmatters mentioned and preferably also some practical training.

ENVIRONMENTAL EDUCATION WITHIN THE STUDY PROGRAMMES AT THE FACULTY OF MATHEMATICS/NATURAL SCIENCES OF THE UNIVERSITY OF JYVASKYLA

Basic studies in ecology and environmental protection.

Soft technology

Content: Circulation and recycle of industrial and commercial waste products, the technique dealing with energy and raw materials, handling and recycling of biological waste products, biological cultivation.

Legislation and administration with regard to environmental protection

Content: Stipulations and provisions in different laws and orders with regard to noise protection; air, water and soil pollution as well as landscape and nature conservation.

Methods for ecology and environmental protection

Content: Scientific philosophy and theory and the choice of research methods, literature and planning; methods for zoological, botanical and environmental protection research; treatment of the results and elaboration of the studies.

Environmental protection in Finland

Content: Natural resources in Finland, environmental protection activities and the bodies responsible, the aim of environmental protection as well as history. Our present environment: soil, air, water, forest, field, bog, beach, mountain, densely built-up areas and landscape.

Courses in environmental protection

Content: Enquiry and interview studies, environmental tasks of the local authorities, noise studies, studies of air pollution, introduction to waste handling and peat production.

In Norway:

A preoccupation with the quality of life, with health and the environment, and with open air recreation has long traditions in Norway. It is sufficient to recall that one of Henrik Ibsen's plays in the last century dealt with the conflict between economics and pollution. The voluntary bodies concerned with the environment also have a long history. Although several highly relevant disciplines have been taught since academic pursuits began in Norway, it is only 15 years since the first problem-oriented courses were established in this field.

A period of intense public debate on environmental protection, lifestyles and national development aims culminated at the end of the 1960s. The most visible result was peaceful demonstrations and a civil disobedience campaign against the Mardøla hydropower plant. Norway even got an ad hoc environment party standing for local elections in the capital, - it even gained a seat in the assembly. It might be that public opinion in Norway went through a change in this period, similar to the process that took place in the 1970s and 1980s elsewhere.

In parallel with these highly visible events, substantial interdisciplinary academic competence was built up in fields as diverse as land management, the philosophy of environmental protection and integrated pollution control.

The entire educational system responded to the challenges by establishing courses as well as institutions. Looking back, we can see that the ad hoc courses served to disseminate information quickly, but cut off from institutional links with creating and applying new knowledge, they soon disappeared. Only the institutions specifically given the responsibility for environmental education have survived.

In 1972, the universities established the framework for their new institutions. The agricultural university at Ås had established its Institute for nature management, the technical university at Trondheim had established KOMMIT, the committee for environmental protection, and the university of Oslo had established the Council for environmental studies. The district college system also took part in this first wave by establishing their leading institution in this field, the two-year degree course for nature conservation at Bø in Telemark.

Two years afterwards some 100 courses were established as options at teacher training colleges, local colleges in the Grundtvig

tradition, and as elements within larger courses at all universities. In part this was in response to a large demand, in part as renaming of existing courses in order to keep up with the demands for new catchwords in the budgetary process.

Types of Courses

In the early phase, it was of paramount importance to draw attention to the problems; there was perhaps more emphasis on describing the challenges ahead than on the smaller steps needed from day to day to reach satisfactory solutions. In the courses where details were entered into, they were the ordinary details of chemistry, biology and economics as it had always been taught. In some cases, there was quite pronounced friction between university departments claiming to "own the problems" so that no part of the subject could be taught ouside its walls. In addition quite unrealistic demands for basic knowledge were made, so that no student could possibly get an approved environmentally relevant degree without first gaining degrees in each of the component subjects. Since one had successfully trained engineers and doctors for centuries without requiring them to gain degrees in economics or chemistry before getting on with applying their knowledge, two main approaches evolved. One was to give a comprehensive and tailored course over several years leading to a degree in environmental management, another was to provide smaller courses in order to supplement existing degree courses.

The agricultural university and the district colleges turned to providing special degrees. Over the years, a generation of nature management graduates have gone into a broad spectrum of jobs, mainly in the public sector. A professional society (Naturforvalterlaget) has been formed and in the future this society and the corresponding society of the university educated biologists (BIO) may well form a pendant to the influential organizations formed by architects, lawyers and so forth.

The strategy of providing supplementary education is not by far as visible, but a few hundred Norwegian graduates with degrees in law, economics, anthropology, physics, paedagogics, medicine, engineering, etc. now have half a year of project work and theoretical knowledge of how to anticipate and approach environmental problems.

The two main approaches are also closely related to the perception of the job market. The number of students for a specialized environment degree must stand in a reasonable relationship to the possible number of jobs, whereas supplementary courses will have a much larger number of potential students.

The present

Today there are 4 fairly large institutions in Norway giving environmental education at university level. They are the same four that were established at the start of the seventies. In addition the department of Geography at Bergen university has designated one post as lecturer in environmental science. Although all the institutions use some common texts, we have seen a certain division of labour in that the University of Trondheim gives courses on the environment in the arctic as well as on the more technologically related aspects such as pollution control. The agricultural university and the district college in Telemark has particular competence in land management and the management of biological resources, whereas Oslo university covers environmental policy, law, economics and energy planning.

KOMMIT in Trondheim and the Council for environmental studies in Oslo cooperate in offering Norway's only "on the job" training scheme for teachers in this field. Several hundred teachers all over the country have gained a half year study credit recognized by all school boards as a basis for a salary increase on a par with supplementary education in the traditional academic subjects.

In the public sector, there has been a need for "on the job" training for planners, partly in order to refresh basic knowledge, partly to put the experience of 5 - 10 years in perspective. This need is catered for by SAMPLAN, an annual course financed by the Ministry of the Environment and staffed by tutors from the universities.

There are only two regular courses that do not require the student to be fluent in Norwegian. Through the Oslo University International Summer School, the Council for environmental studies offers an 8-week course "Energy planning and the environment". This course regularly attracts graduate students from all over the world. The other international course is given by the development studies unit at the agricultural college (NORAGRIC) at Ås, this gives a survey of environmental problems with a focus on Africa and is aimed at students from developing countries at a doctorate level.

Paedagogics

There is no common method for all courses in this field. Obviously, one cannot escape exercises in calculation in the bits concerned with economics course, nor some field work in order to understand eutrophication and acidification. There may be a

larger emphasis on group work than in other fields. This is often due to the need to draw on diverse sources of expertise in order not just to carry out a diagnosis, but also to ordain a cure.

Another paedagogical device which most environmental subjects have in common with the geosciences is excursions with the tutors and fieldwork. This is easy enough when local conditions are under scrutiny. When journeys of more than 2000 kilometres must be undertaken in order to reach the relevant part of Norway, fieldwork becomes economically difficult, and fieldwork in developing countries is almost impossible.

In Sweden:

There have been two tendencies in the development of environmental education in Sweden in the period. The short orientation courses which have existed in all universities and other institutions of higher education have been considerably reduced or have disappeared completely. In particular in the technical universities, the situation has further deteriorated. There is nothing to indicate that these short courses will be replaced by a more comprehensive integration of environmental subject-matters in the compulsory education, but this is a field which it is difficult to talk about without having carried out special studies. And no such studies have been made.

The long-cycle complementary courses comprising one-year of full-time studies which were offered at the Environmental Studies Programmes of the Universities of Lund and Umeå have been discontinued.

The health inspector education at the Health and Environmental Protection Line of the University of Umeå has been given more importance through a programme of further education of active health inspectors. Furthermore, the environmental education has of course been given more emphasis at the Agricultural University where it has been integrated in the landscape architect, agricultural and forestry study programmes.

Some of the regional institutions have set up long-cycle or medium-cycle courses in the field of environmental education. An example to this effect is the course set up in Kalmar.

Within the branches of biology and geology, there has been an increased interest in environmental problems and in particular in the classical nature conservation has been met with particular

interest within the branches of biology and geology. The short-cycle courses (the socalled single-subject courses), which have been established, have primarily been specialized courses.

In short, the interdisciplinary and complementary environmental courses have weakened or stagnated in this period, whereas certain specializations and professional fields have strengthened.

On the initiative of the Contact Group, the Environmental Studies Programme group has made an inventory of environmental education at Swedish universities and other institutions of higher education. From this appear a number of general trends in the development of interdisciplinary environmental education.

During the 1970s and at the beginning of the 1980s, there has been a drop in the interest in interdisciplinary courses in environmental protection. This trend is not unique for Sweden. It is, to a smaller or greater extent, characteristic for all industrial countries. There are several reasons for this. A tougher labour market has led to a more short-sighted and conjuncture-related interest in the content and form of the education from both the authorities and students. Certain circles seem to be of the opinion that the environmental problems have either been solved or that the economic development has meant that they have become less topical and acute. None of these opinions are of course correct but they reflect the academic institutions' lack of contact with society or perhaps rather the trendyness and conjuncture-related nature of this contact. Why it is so is a subject for reflection. In Sweden, part of the reason for this may be the pronounced bureaucratization of the higher educations sector. Labour market statistics, concentration of financing problems, etc. have dominated more than actual attempts to analyze the society's long-term needs for knowledge.

In spite of this, there are - as mentioned above - probably a number of positive things to point at which do not appear from the inventory. At the two institutions which at present may be said to be the most obvious representatives of interdisciplinary environmental education - the Environmental Studies Programme at the University of Lund and the Health and Environmental Protection Line of the University of Umeå - there has been a continuous development of courses. The education in Kalmar is said to have a considerable intake to its environmental line even today.

The most important feature is however what is possibly the first step in a development at the technical universities. The Royal Swedish Academy of Engineering Sciences has presented a joint

proposal of demands with regard to environmental education which can be labelled as being far-reaching and radical in this context. Among the proposals, there is a demand for biology being part of the admission requirements to the higher technological courses, compulsory interdisciplinary courses for all technologists, a strengthening of the environmental education as such and efforts in the field of research.

The environmental centre at Kalmar Technical University is said to have received more considerable resources as a direct consequence of the report made by the Royal Swedish Academy of Engineering Sciences. There is no information with regard to the extent to which the other technological institutions will follow suit.

Apart from the above-mentioned centres for the development of environmental education, the smaller regional institutions can be said to have been important initiators of innovation in this field. This is not totally unproblematic. The small institutions have a small basis both as regards staff and resources for linking education with research. At the end of the period, there has been an increased interest in Sweden as regards such a linkage, after the country had reached a very low level according to an international yardstick. In the reforms of the teaching profession which are now taking place, a linkage will be included between research and education for those teacher groups who have carried out the greatest part of the low-level academic education in Sweden.

At central level, the interest in environmental education has been minimal. A working group concerning environmental education was appointed and did exist for a number of years - mainly on the paper without reaching any apparent results.

It is too early to say anything as to the extent to which the new organization with a department of the environment will be able to influence on the development of environmental education. There has, however, been a strengthening of the interdisciplinary research resources, and the National Board for Environmental Protection has created a research field within the social sciences which has its own funding within the framework of environmental research.

For concrete examples as regards the offer of courses, reference can be made to the inventory which has been made (Environmental Education: Sweden, see below).

Inventory of the Environmental Education in Sweden: It comprises the following:

Single-subject courses

Under this heading, there are courses of varying duration. They are mainly courses of 5, 10 and 20 credit points, i.e. courses of 5 - 20 weeks duration. They are primarily interdisciplinary courses or courses directed at a broader user group, but there are even relatively "narrow" courses.

General lines of study

Within these, there are some of a relatively great value for environmental protection varying from courses which are totally environmentally oriented to courses where only elements are of environmental importance. A short inventory of these lines is being made.

Environmental education at the technical universities

The technical universities generally offer a number of interdisciplinary courses for students from one or several different sections. It is mainly these courses which are recorded. Within the technological courses of education, it is very difficult to delimit these from the more specialized courses of great importance to environmental protection. Therefore, it is mainly exclusively the interdisciplinary courses which are recorded.

Local lines of study

Various universities and other institutions of higher education offer a number of local vocationally-oriented lines of study.

Lines of study - the Agricultural University of Sweden

At the Agricultural University, students are trained for work in the socalled "open-space" occupations, but many of them will also have assignments which are directly connected with environmental protection, e.g. landscape architects and forestry graduates.

Complementary and further education within health and environmental protection

The courses recorded are offered as complementary courses and are placed all over the country. For further information, contact the University of Umeå.

Synopsis of the development in the Nordic countries

The need for coordination of environmental education between different levels of education was emphasized at the Tbilisi-conference and also at the follow-up expert meeting which was held in Paris in 1982. Here it was emphasized that a way to build up a consistent policy for the environmental education area would be to set up coordinating bodies for the different institutions involved in environmental education.

When considering the setting up of coordinating bodies, the individual countries have evidently kept aloof from establishing a particular centre - or institute for environmental education with the aim of creating a unifying formation of theory on the natural basis of society on the one hand and on the other hand from developing environmental education as an individual discipline.

The reason for this has been that the various aspects of environmental education are most perfectly elucidated in their disciplinary context - which means that the best place to offer the education is in the respective disciplinary environments. At the same time, it has been emphasized that experience shows that such a structure where existing educational offers are combined requires information and coordination.

Environmental education at universities and other institutions of higher education has changed in the past 10 years.

Within the traditional courses of education, environmental education has developed in time with the environmental problems of the society. The environmental problems were taken up by researchers, and possibilities were created for offering new courses in the study programmes.

At several places, there have been problems related to the introduction of a subject-area which is interdisciplinary in a narrow or wider sense and which at the same time is related to pronounced societal conflicts.

The Tbilisi-recommendations and the existing Nordic and other publications from international cooperation agencies have been of great support for those teachers who wanted to integrate environmental education in their subject-area.

The break-through has of course no doubt mainly taken place for those subject-areas which have a central role in general environmental descriptions, e.g. biological and geological/geographical

disciplines. Generally, it can be noted that the break-through phase for narrow and wide environmental education courses is over, but the total offer of courses is limited and the participation in these is very small.

Thus, there are very few examples of environmental education as a compulsory element, and it is very rarely included in the overall aims of the courses of education at universities and other institutions of higher education.

The general impression of the development in the past 10 years is:

- that the number of courses has increased. The course descriptions and literature lists indicate that the courses build on a more qualified subject-related basis and that at the same time more subject-related aspects are included.

- There are examples of experiments with interdisciplinary courses involving several main areas/faculties.

- At universities and other institutions of higher education, activities have not been established for complementary education in the environmental field. A number of experiments of short or long duration have however been carried out. Some of them still exist.

- Work environmental education does not yet seem to have gained sufficient foothold in all disciplinary environments which may be due to the fact that as per definition it does not belong under the heading environmental education.

- the "Surveys of environmental education in environmental studies at universities and other institutions of higher education in the Nordic countries - courses and literature" which were published in 1986 give a clear indication of the fact that environmental education has gained a foothold at the educational institutions. This development can have a resulting effect on the other disciplines so that a consequence analysis of the impact of societal activities on the environment will be linked with the other subject-related study elements.

CHAPTER III: CHALLENGES

1. Time Perspective

In higher education, the time span is long between the planning of changes and the impact of these changes in society. If it is therefore to be meaningful to talk about challenges for the education system which are worth while, the time perspective is one or several decades. Such a long time passes from you start planning the changes - via the practical implementation in the university system - until those who have received the education come out onto the labour market and their abilities will actually have an impact on the development.

Some trends in the future environmental situation

During the past decade, the development in the environmental field has led to the fact that the protection of the environment will - in the coming decades - be different from what it is now and from what it has been in the past. It is not clear to which extent this change has been interpreted by the education system. Some of the changes have clearly been misinterpreted. There seems to be a belief that the environmental problems have to a certain extent been solved.

Using catchwords, one can point at the following factors which ought to influence on environmental education:

1) The cleaning-up phase is more or less over or is at least about to come to a close.
2) The linkage between energy and resource economy and environmental problems has become more and more apparent.
3) The pollution and the pollution picture change from large point sources to more diffuse problems.

The socalled "open-space" occupations (agriculture and forestry, fishing, reindeer breeding, etc.) cause vast problems and are facing large-scale reorganizations. Intensification of the activities, increased mechanization and use of chemicals have been new features. Techniques and methods may change even further.

The reorganization of industry from a heavy, relatively polluting and energy consuming industry to an increase in the service industry has lead to considerable decreases in the discharge into air and water. At the same time, one must be aware of the fact that many new industries are using solvants, more or less complex chemical products, exotic metals, etc. The environmental problems caused by these new industries can be a lot more difficult to detect and should not be underestimated.

Some general trends in the education system

The general economic climate has led to an increased pressure on the higher education institutions to make them optimize their activities. Increased orientation towards directly professionally oriented courses of education is also a trend which has been strengthened by public grants and the choice of education made by the students. This leads to the fact that there will be less time for more general knowledge and elements of contemporary studies, protection of the environment, etc. The generally lessened interest in natural sciences and technology in not directly environmentally oriented courses of education and the general debate constitute yet another factor.

General challenges (without any particular logical order or priority)

The trends in the education system imply that the need for integration of environmental questions in different courses become more important. In the initial, problem-identifying phase of environmental protection (see section II), short interdisciplinary introduction courses could play an important role. It is essential that environmental problems are integrated in different courses and are considered to be a natural element of these and an occupational role for many groups. It is particularly important to integrate the environmental aspects in two groups of courses: natural sciences and technological courses aiming at occupations in industry as well as the courses in economics and administration which have increased greatly in the past few years. The objective of such courses must be to impart the awareness that environmental questions are just as important as technical and economical effeciency in industry or public administration.

The more and more intricate and complex nature of environmental problems has had the effect that there is an increased need for interdisciplinary education and research. At the same time, one can hardly say that the attempts to reach an interdisciplinary organization have been particularly successful. It is an important task for the universities and other institutions of higher education to develop interdisciplinary cooperation within education and research. Models to this effect exist at a number of universities and other institutions of higher education in the Nordic countries.

The development of new activities, new types of industries, etc. is of course making continuous demands for innovation in education. In those courses which are now coming into existence in

connection with great expectations of largely expanding aquaculture and biotechnology, it is difficult to see that the environmental problems are given the attention they deserve. In spite of the fact that these courses are built up in cooperation with institutions where knowledge and awareness of environmental problems ought to be considerably greater than in the traditional technical circles, this however does not seem to be reflected to a very great extent. In other words: the biological disciplines and representatives of the discipline seem to be just as technically and economically oriented in their view. It is essential that the environmental questions are in one way or the other emphasized in these courses if we are to avoid problems like the ones we have experienced during the whole post-war period when building up industry. The planning of the education must assume its societal responsibility.

The connection between natural resource economy and effecient use of energy and protection of the environment must in one way or the other be emphasized in the education. Effective use of resources is in many ways the most important and long-sighted instrument of environmental protection. It is also extremely important that this is integrated in technical and economical courses. Natural resource economy is a subject-area which, to a very great extent, needs to be developed both as far as research and education are concerned.

Protection of the environment in the long term depends on the general opinion and backing of the population. In the environmental protection context, the role of the school is therefore of decisive importance. This must be reflected in the teacher training quite differently from what it is at present. There is a great need for important elements of environmental questions both in the initial teacher training and in the complementary and further education of teachers. The need for complementary teacher education is acute and this is also due to the fact that the time span between measures and their effect on society is long.

5. Challenges for Nordic Cooperation

The experience gained by the Contact Group in its activities points at the existence of certain areas which are particularly suited for Nordic cooperation.

Within certain specialized areas of environmental protection, the number of experts in each country is very small and the need for exchange of knowledge, materials and experience is therefore particularly great. This may for instance apply to environmental

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law, a number of specialized research areas where one country may, for special reasons, have developed greater competence (dioxine in waste incineration, environmental effects of Arctic technology, measures against acidification of lakes, rivers, etc.). Within such areas, there is a need for more formalized **joint Nordic further education** (regular or complementary courses).

This combination of specialization and different experience together with great similarities between the Nordic countries, which is one of the most important prerequisites for Nordic cooperation, should, to a greater extent, be used for exchange activities. Such exchange activities should be directed both at teachers and students. In addition, one may in passing point at the importance of exchange of civil servants which can indeed be very fruitful.

The organizational form of increased Nordic cooperation in further education and exchange can be discussed. Different models already exist in Nordic cooperation, e.g. the Nordic colleges, the Nordic research courses and institutes like the Nordic Institute for Studies in Urban and Regional Planning (Nordplan). It goes without saying that increased coordination of the activities within already existing organizations will be the most effecient. The coordination in a secretariat under the Nordic Council of Ministers should make this much easier. A prerequisite is however some form of formalized cooperation between the Nordic Senior Officials' Committee for Environmental Affairs (Ek-Miljö) and the cultural/educational side of the secretariat.

In principle, a joint Nordic **production of teaching material** should be a quite reasonable idea. In practice, experience with such a production seems to be somewhat mixed. If the ideas of a joint production of teaching materials should subsist, this should be very well prepared and structured in advance. It seems as if the whole area should be scrutinized critically. An evaluation of all joint Nordic teaching material production ventures both at school and university level should - according to the Contact Group - be carried out and it should thus not only be limited to the environmental area.

Finally, when coordinating Nordic cooperation in the environmental area - the linkage between the university level on the one hand and the school system on the other should be made better than it has been sofar.

CHAPTER IV: FUTURE COOPERATION IN EDUCTION AND RESEARCH

1. Environmental courses are now offered in most courses of education. Environmental education does however play very different roles and is not always firmly established. Environmental education has developed over a 10-year period with close Nordic contacts, and it is now more evident that the concrete new environmental cases are of a global nature. This makes it necessary that environmental education is closely linked to the international development and particularly to the research activities which are taking place. Environmental education at university level must therefore be further linked to the subject-divided and interdisciplinary research activities which are dealing with various environmental questions.

   In the Nordic countries, this further development of environmental education can profitably take place in joint Nordic cooperation. At the same time, the contact to the European and international development could continue to be organized at Nordic level and hereby facilitate the import and spread of ideas.

2. During the last phase of the work in the Nordic Contact Group for Environmental Education, contacts have been established to a number of international organizations in order to be able to utilize their experience. There are already a few concrete cooperation projects which can form the basis of extended exchange activities.

OECD:	Literature specialists/technical subjects
Council of Europe:	Conferences on individual research questions
UNESCO:	General Educational conferences/North-South
IUCN:	Strategies on education and environmental questions
EEC:	Cooperation projects.

   The special Nordic aspect must be to choose research areas in development which are of special interest to Nordic environment and nature areas.

   The extent to which the Nordic countries shall go into development assistance in other parts of the world with regard to environmental conditions, a special educational/research-related/administrative extension should be made, as Nordic experience cannot be transferred just like that.

3. In continuation of the present programme, there are a number of individual possibilities of intensifying the Nordic contact activities which do not require a new organization. The possibilities comprise the use of external examiners, stimulation to carry out teacher and student exchange. The Nordic aspect is clear and it invites the institutions to use the given possibilities and they are stimulated by special appropriations for this purpose.

   In connection with Nordic research initiatives, it is proposed that the projects should be extended to include an information part. It is recommended that the appropriations are extended by for instance 10,000 DKK in order to ensure that the results of the projects will be known and used in the Nordic countries.

   It is proposed that the use of guest professors for individual guest lectures is increased. This particularly applies to the use of environmental administrators on lecture trips in the Nordic countries. The national competence of the individual countries would be used in the other countries for a mere 1000 DKK extra per visit.

   It is proposed that the use of the already established activities are stimulated. This will most easily take place through student and teacher exchanges. It is proposed that there shall be a yearly appropriation of 60,000 DKK for students staying at other Nordic universities offering environmental education and research. There should be an appropriation of a corresponding amount for teachers' study visits at other Nordic universities: i.e. 60,000 DKK for two full-time paid months a year.

   Mutual Nordic evaluation. It is proposed that the Nordic courses of environmental education are mutually evaluated in order to profit from experience gained. The evaluations should be prepared in writing and be concluded by a report after the visit and interviews of a small Nordic group. The evaluations are expected to be made by staff and can be done for 30,000 DKK a year - with a yearly evaluation.

   Environmental seminars. It is proposed that there shall be held environmental seminars, and financial support should be granted to cover travel expenses.

4. Research courses under Nordic auspices. In Nordic cooperation, research courses with environmental content have been organ-

ized in several different contexts. But there is no joint body which could coordinate these activities, and that is the reason why they have been arranged under different auspices and in different ways.

Nordic cooperation with regard to research and further or complementary education could be made closer through rational use of existing financing possibilities and through coordinated use of environmental research funds by initiatives of the Nordic Senior Officials' Committee for Environmental Affairs (EK-Miljø). The course activities can be supplemented by the organization of short Nordic environmental seminars on selected topics of common interest and most simply by a more increased mutual use of guest professors of environmental subjects.

The traditional organizers of research courses, Nordic Research Courses and the Nordic colleges of ecology are having more applicants now, and the result is that competition for funds has become tougher. There is a need for a new procedure and here it should be ensured that environmental courses will be held at Nordic level. The not very bureaucratic procedure for the ecological courses, etc. which has existed sofar ensures a rapid reply and optimal use of appropriations.

The Nordic (biological) summer courses and the existence of Nordic field-stations could be used for establishing a series of broad introduction courses to environmental research. Acidification, oxygen depletion in the Baltic, heavy metals in bottom feeders are well-known and still relevant topics. Agriculture and forestry are exploring a number of environmental topics - both the biological, the legal and the economical side of them.

The industrial development provides a number of topics which go quite a bit further than production-related and chemical-analytical relations. The introduction of genetically engineered organisms is the latest example. The list is long and also comprises pesticide residues, chemical waste, ground water and food.

It is important to get the students to participate in the different project areas and to ensure the disciplinary specialization on the one hand and the necessary breadth in environmental research on the other hand.

The topics are thus legion and the possibilities are there for developing a Nordic environmental research cooperation of importance to higher education.

APPENDIX: SURVEY OF TOPICS TREATED AT NORDIC CONFERENCES IN THE PERIOD 1980-85

NORDIC CONTACT GROUP FOR ENVIRONMENTAL EDUCATION AT UNIVERSITY LEVEL SECRETARIAT FOR THE NORDIC COUNCIL OF MINISTERS

Survey of topics treated at Nordic conferences in the period 1980-85 to be used in the teaching of environmental education at Nordic universities and other institutions of higher education.

"Nordic Conference on the Integration of Environmental Matters in the Technological courses at Universities and other Institutions of Higher Education"

KONGSVOLL, NORWAY: 18 - 21 AUGUST 1980

1. Ecology as a basic subject in environmental education at the technological courses
   Content: Soil as recipient for waste water. Soil pollution via air. Fertilization. Pesticides.

2. Technological development and environmental conditions
   Content: Introduction. Technological development - economy of capital elements. Choice of form of economy. Connections between form of economy and discharge of substances.

3. Physical planning in the education of planners with a view to the protection of the environment
   Content: On physical planning. On environmental goals. On the education of planners, e.g. at Tammerfors. On an educational experiment.

4. Measuring techniques in environmental protection
   Content: The ecological background for the needs of the measuring technician. Environmental-technical part. Special requirements on the measuring technique in environmental protection.

5. Systems thinking in environmental protection
   Content: Introduction. Something about the nature of environmental problems. Systems concepts and systems types. Identification - analysis - measures. Identification of environmental disturbances. Systems-related analysis of environmental problems. Measures. A and B society.

6. Consequences of hydro power development
   Content: Introduction. Hydro electric power stations. Environmental impacts. Social and societal consequences. Experience from expanding municipalities.

7. Transfer of technology to developing countries

"Nordic Conference on the Integration of Environmental Aspects in the Agricultural Education at University Level"
KOLLE KOLLE, VÆRLØSE 28 - 30 AUGUST 1981

1. Drainage in agriculture and environmental aspects
   Content: Main drainage. Subsidiary drainage. Drainage objectives. Cultivation experiments. Deposits of sulphure, iron and ochre. Transformation of plant nutrients, particularly nitrogen. Water balance.

2. The use of pesticides in agriculture, particularly herbicides
   Content: The global pesticide consumption. The most characteristic feature of pesticide consumption in Denmark. Herbicides. The importance of weeds. Requirements of the agricultural sector, the instructor and research. The prerequisites and conditions of the education. Relevant reports, examination papers and literature.

3. Combating of pests
   Content: Introduction. Pests - objects of control. Some dynamic aspects of growth illnesses. The number and population variations of pests. Growth protection - pests control. Teaching materials.

4. The possibilities of agriculture to contribute to the energy supply
   (A publication "Energi från lantbruket" (Energy from agriculture) has been issued).

5. Acid rain and its effects
   (A publication "Forsurning - Årsaker, virkninger og tiltak" (Acidification - causes, effects and measures) has been issued.

6. Quantitative and qualitative aspects of various exploitation forms in agriculture
   Content: Exploitation forms. Soil treatment. The organic and biological state of the soil. Rotation of crops and mixed crops. Choice of strain and plant breeding. Weed control.

Illness and pest control. Animal husbandry. Size of production. Quality of production. Effects on the external environment. Resource considerations. Financial considerations.

"Nordic Conference on the Integration of Environmental Matters in the Training of Public Planners"
HANAHOLMEN, FINLAND 16 - 18 AUGUST 1982

1. Ecology and planning
   Content: The municipal planning system. The ecology of typical land use. Conflicts. The ecological consequences of political decisions. Literature references.

2. Environmental planning in developing countries
   (published in English with the title: "Environmental Aspects of Agricultural Development Assistance").

3. Considerations for outdoor life
   Content: Outdoor life as a consideration in physical planning. Important requirements of the areas. Implementation of planning work. Assessment of some outdoor areas based on the considerations listed above.

4. Planning of the open country
   (A booklet "Kulturlandskap och samhällsplanering" (Landscape and physical planning) has been published).

5. Planning of energy supply
   (A booklet "Energiförsörjning" (Energy supply) in production).

6. Planning methods and interaction between Man and his environment
   Content: The general knowledge of and attitude to environmental questions. The atmosphere of decision. Education and research activities at academic level.

"Conference on the Integration of Environmental Aspects in Higher Biological Education"
REYKJAVIK, ISLAND 29 - 31 AUGUST 1983

1. Work environmental knowledge for biologists
   Content: Inventory of educational elements around work environmental questions. Analysis of the present situation. Need for work environmental knowledge for biologists. Integration of work environmental matters in biological education. The

content of the work environmental education in the biology studies.

2. Modern ecology in the nature conservation planning
Content: The nature - society relationship. The object of the nature conservation planning. Inventory. Planning. Management. Monitoring. Perspectives of nature conservation planning.

3. Environmental protection in the Arctic and Subarctic areas
A booklet "Miljøvern i arktis" (Environmental protection in the Arctic Area) is in production.

4. Fresh water ecology in subarctic environments
Content: Lakes: Climate, the surrounding environment, physical-chemical parametres, biological environment, the ecosystem. Running water: Precipitation area and the course and fall of the stream, current speed and the nature of the bottom, flow, temperature, chemical parametres, primary production, allochtone material, invertebrates, the fish fauna, food relations and transformation of energy. Straightening of rivers and lakes: Erosion and transport of materials, possibilities of adjusting or extenuating influence, effects on flow downstream. Straightening of glacier torrents.

5. Water pollution and its impacts and other human influence on the water environment in tropical and subtropical climates
Issued in English: "Water Management and Protection of Aquatic Living Resources in Tropical and Subtropical Climates"

"Conference on the Integration of Environmental Aspects in the University Subjects Geology, Geotechnics and Physical Geography"
NARSSARSSUAQ, GREENLAND, 15 - 22 AUGUST 1984

1. Geological data for use in planning
Publication "Geodata" in production.

2. Geomedicine in the university courses in geology, geotechnics and physical geography
Content: Target group. Definition and delimitation of the subject. Geochemical environment. Geochemical processes. Transfer from the geochemical environment to human beings and animals. Compilation and presentation of medical information. On the study of relations in geomedicine. Use of geomedicine.

3. The human being as a geological force - geotasks in developing countries
   Publication "Geouppgifter i u-land" (Geotasks in developing countries) in production.

4. Waste disposal in mountains
   Content: Introduction. Waste. Sites for waste disposal. Location studies for disposal sites in mountains. Diffusion risk. Safety. Example of disposal in mountains.

"Conference on the Integration of Environmental Aspects in the Law Education in the Nordic Countries"
TJARO, BLEKINGE, SWEDEN 21 - 23 AUGUST 1985

1. General environmental law - a survey of the instruments of environmental law.
   Publication "Miljörättslige grunnproblem" (Basic Problems of Environmental Law) in production.

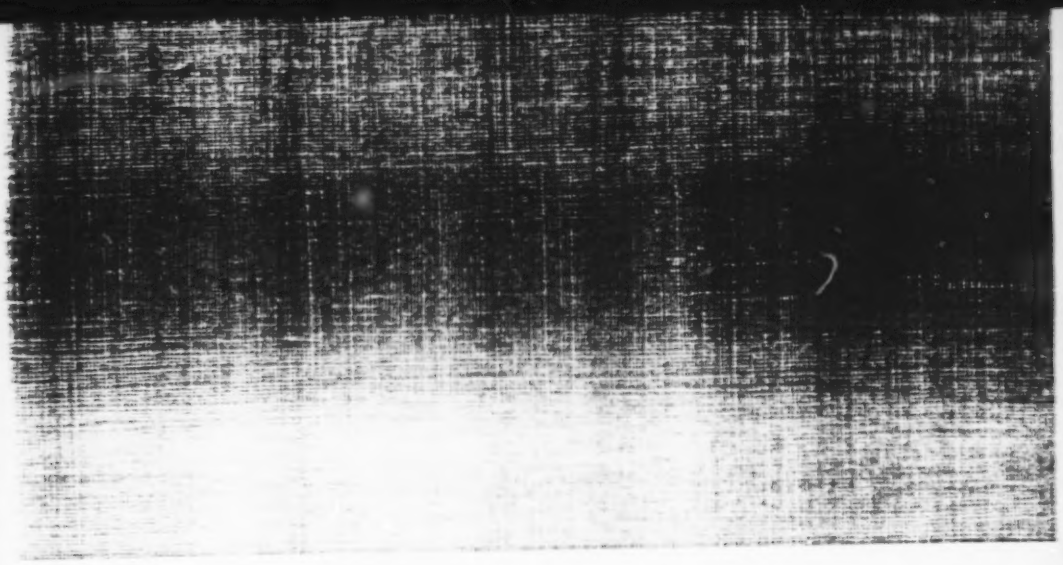
2. Consequence analysis - a tool for making better decisions
   Content: What is a consequence analysis (CA). What do we want to reach. CA as an individual system or as a part of a sector decision-making system. Which requirements should be made to a perfect CA-process. Actor in the process - obligations and rights. Participation - aims and methods. Consequence analysis techniques. Follow-up and control. Experience with CA in the Nordic countries.

3. Enforcement of the law - supervision, approval and setting of norms
   Content: Introduction. Details on how norms are set. The system of supervision and control. Presentation of charge by supervision authority to police/prosecution. The position of private persons denouncing irregularities. The Police and Prosecution. An environmental police force. The future.

4. How is the legislation administered locally and which consideration is made of local administration when making rules
   Content: Fixing of concepts. The historical background. The decentralization gains enormous speed in the 1970s. Environmental law in the case of centralization/decentralization. Some concluding remarks.

5. Environmental education for the legal profession

Content: The importance of the environment from a legal point of view. The role of the environment in the Law studies. Environmental-legal methods/concepts. Main features of actual environmental education. Environmental law as an environmental science.



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